

Meeting abstract

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## 1044 High spatial and temporal resolution MRA (TWIST) in acute aortic dissection

Florian M Vogt\*<sup>1</sup>, Stefan Maderwald<sup>1</sup>, Holger Eggebrecht<sup>1</sup>, Frank Breuckmann<sup>1</sup>, Randall Kroeker<sup>2</sup> and Jörg Barkhausen<sup>1</sup>

Address: <sup>1</sup>University Hospital Essen, Essen, Germany and <sup>2</sup>Siemens Medical Solutions, Erlangen, Germany

\* Corresponding author

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### Introduction

Endovascular treatment of descending thoracic and abdominal aortic dissection has emerged as an alternative to open surgery. In terms of endovascular aortic stent-graft placement planning, MRI appears to be particularly useful as it can provide a comprehensive pre-interventional diagnostic evaluation of the vascular aortic morphology. However, standard MRA techniques provided no information on flow and tissue perfusion. Until now sufficient temporal resolution and coverage for the assessment of aortic dissection could only be achieved sacrificing spatial resolution, thus requiring an additional high resolution MR angiography. Our study aimed to evaluate the image quality and the diagnostic accuracy of a recently developed time-resolved 3D MR angiography technique (TWIST) combining high spatial and temporal resolution for the pre-interventional assessment of aortic dissection.

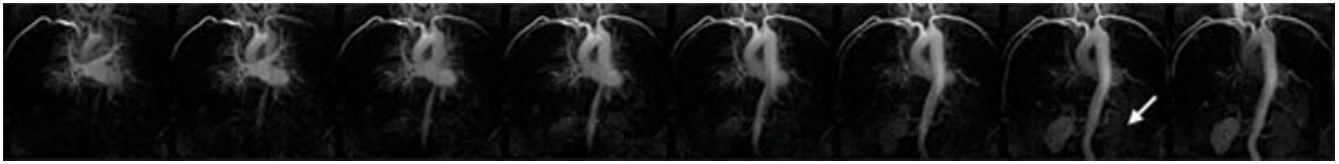
### Methods

Twenty patients (mean age 58 y) with dissection of the descending thoracic and/or abdominal aorta underwent contrast-enhanced time-resolved 3D MR-angiography. All imaging was performed on a 1.5 T scanner (Avanto, Siemens, Medical Solutions, Erlangen, Germany). Following automatic injection of 5 ml Gadovist (Schering, Berlin, Germany) at 3 ml/sec, 15 consecutive coronal T1w 3D datasets (TR/TE 2.8/1.2 ms; FA 25°; slices 64; matrix 231 × 320; spatial resolution 1.9 × 1.6 × 2.1 mm<sup>3</sup>, effective temporal resolution 1.6 s) were acquired using the TWIST sequence and parallel imaging technique (GRAPPA; R =

2). For TWIST all k-space points are sorted according to their radial distance in k-space and the k-space is divided into a central region A and a peripheral region B. While region A is completely sampled for all 15 data sets, region B is undersampled by a factor of n to improve the temporal resolution. About 5 minutes following the time-resolved MRA, a conventional high spatial resolution MRA (0.1 mmol/kg Gadovist®) was acquired (breath hold 25 s) using a 3D spoiled gradient-echo sequence (TR/TE 3/0.97 ms, FA 25°, slices 72, matrix 289 × 384; voxel size 1.4 × 1.3 × 1.8 mm<sup>3</sup>). Both MR data sets were evaluated and compared for image quality and visualization of vascular details. A radiologist and an interventional cardiologist assessed the additional diagnostic information of the TWIST concerning contrast enhancement and tissue perfusion.

### Results

TWIST MRA could successfully be performed in all patients; no technical or reconstruction problems occurred. Image reconstruction time amounted to 5 minutes for the TWIST sequence. The image quality of the source images of the TWIST protocol was rated comparable to those of the conventional MRA. The presence of artifacts was comparable for both sequences. Due to the dynamic character of the TWIST sequence no venous overlay hampered the assessment of the arterial system. TWIST-MRA characterized true and false lumen as well as the origin of the branch vessels correctly in all patients. The temporal resolution of the TWIST-MRA allowed visu-



### Figure 1

Coronal MIPs of subsequent time frames (time delay 1.6 s between single frames) acquired in a 55 y old male patient with acute aortic type B dissection. The high temporal and spatial resolution allows visualization of delayed filling of the false aortic lumen. The left renal artery originating from the false lumen results in a delayed perfusion of the left kidney (arrow).

alizing the transit of the contrast agent bolus within the true and the false lumen (Figure 1) and provided additional information compared to the static MRA in 7/20 patients. These findings had impact on therapy planning and the combined morphologic and dynamic imaging of the TWIST MRA provided reliable information for successful planning of endovascular stentgraft repair in all patients.

### Discussion

TWIST MRA is a robust technique that combining functional and morphological information. Thus the time-resolved TWIST MRA provides all information for treatment planning in patients suffering from acute aortic dissection.

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